

WHAT IS CLAIMED IS:

1. A method for sterilizing at least one item in a chamber, comprising the steps of:

- (a) disposing the at least one item in the chamber;
- (b) pumping the atmosphere from the chamber until the atmosphere of the chamber has a pressure of less than one torr;
- (c) adding water vapor and ozone to the chamber; and
- (d) generating electrical discharge in the chamber, such that said electrical discharge produces OH radicals from said water vapor and said ozone so as to contribute to sterilization of at least part of the at least one item.

2. The method of claim 1, wherein said step of pumping is performed by pumping the atmosphere from the chamber until the atmosphere of the chamber has a pressure of less than half a torr.

3. The method of claim 1, further comprising the step of producing said ozone from oxygen using an ozonizer.

4. The method of claim 1, further comprising the step of producing said water vapor by passing at least part of said ozone over a reservoir of water.

5. The method of claim 1, wherein said step of adding is performed, such that said adding increases the pressure of the atmosphere within the chamber.

6. The method of claim 5 further comprising the step of breaking said electrical discharge when the pressure of the atmosphere within the chamber is between 5 torr and 15 torr.

7. The method of claim 6, wherein said step of adding is performed, such that said adding increases the pressure of the atmosphere within the chamber at least until said step of breaking is performed.

8. The method of claim 7, further comprising the step of performing a cycle including said steps of pumping, adding, generating and breaking.

9. The method of claim 8, wherein said step of performing said cycle is performed at least 20 times.

10. The method of claim 8, wherein said step of performing said cycle is performed at least 60 times.

11. The method of claim 8, further comprising the step of allowing said OH radicals to diffuse in the chamber for a specified diffusion time at the higher pressure end of said cycle.

12. The method of claim 1, further comprising the step of recycling at least part of said ozone which was added to the chamber.

13. The method of claim 1, further comprising the step of injecting radicals into the chamber.

14. The method of claim 13, wherein said radicals include OH radicals.

15. The method of claim 13, wherein:

- (a) the at least one item has an internal volume; and
- (b) said step of injecting is performed by injecting at least part of said radicals into said internal volume of the at least one item.

16. A method for sterilizing at least one item in a chamber using a plasma gun, comprising the steps of:

- (a) disposing the at least one item in the chamber; and
- (b) injecting radicals into the chamber so as to contribute to sterilization of at least part of the at least one item.

17. The method of claim 16, wherein said radicals include OH radicals.

18. The method of claim 16, wherein:

- (a) the at least one item has an internal volume; and

- (b) said step of injecting is performed by injecting at least part of said radicals into said internal volume.

19. The method of claim 18, further comprising the step of mechanically connecting the at least one item to a connector arrangement, wherein said step of injecting is performed by injecting said part of said radicals into said internal volume via said connector arrangement.

20. A system for sterilizing at least one item, comprising:

- (a) a chamber having a first door, said first door being configured, such that the at least one item is entered into said chamber via said first door;
- (b) a pumping system associated with said chamber, said pumping system being configured to pump the atmosphere from said chamber until the atmosphere of said chamber has a pressure of less than one a torr;
- (c) an ozone and water vapor system associated with said chamber, said ozone and water vapor system being configured for adding ozone and water vapor to said chamber;
- (d) an electrode arrangement disposed in said chamber; and
- (e) an electrical supply system electrically connected to said electrode arrangement, said electrical supply system and said electrode arrangement being configured for generating electrical discharge in

said chamber, such that said electrical discharge produces OH radicals from said water and said ozone so as to contribute to sterilization of at least part of the at least one item.

21. The system of claim 20 wherein said pumping system is configured to pump the atmosphere from said chamber until the atmosphere of said chamber has a pressure of less than half a torr.

22. The system of claim 20 wherein said ozone and water vapor system includes an ozonizer configured to produce said ozone from oxygen.

23. The system of claim 20 wherein said ozone and water vapor system includes a reservoir configured for storing water, said ozone and water vapor system being configured to produce said water vapor by passing at least part of said ozone over said water.

24. The system of claim 20, further comprising a control system configured for actuating said ozone and water vapor system, such that said ozone and water vapor system adds said ozone and said water vapor to said chamber thereby increasing the pressure of the atmosphere of the chamber at least until said electrical discharge is broken.

25. The system of claim 24, wherein said control system is configured for performing a cycle including:

- (a) actuating said pumping system to pump the atmosphere of said chamber until the atmosphere of said chamber has a pressure of less than half a torr;
- (b) actuating said electrical supply system to generate said electrical discharge in said chamber;
- (c) actuating said ozone and water vapor system, such that said ozone and water vapor system adds ozone and water vapor to said chamber thereby increasing the pressure of the atmosphere within the chamber; and
- (d) actuating said electrical supply system to break said electrical discharge when the pressure of the atmosphere within said chamber is between 5 and 15 torr.

26. The system of claim 25, wherein said control system is configured for performing said cycle at least 20 times.

27. The system of claim 25, wherein said control system is configured for performing said cycle at least 60 times.

28. The system of claim 20, further comprising a biological filter configured to filter air entering said chamber on completion of a sterilization process.

29. The system of claim 20, further comprising a ozone destruction filter configured to substantially prevent a part of said ozone exiting to a surrounding atmosphere when said pumping system is actuated.

30. The system of claim 20, wherein said electrode arrangement includes an electrode which is implemented as at least part of said first door.

31. The system of claim 20, further comprising a second door configured, such that the at least one item is removed from said chamber via said second door on completion of a sterilization process.

32. The system of claim 31, wherein said electrode arrangement includes a first electrode which is implemented as at least part of said second door.

33. The system of claim 32, wherein said electrode arrangement includes a second electrode which is implemented as at least part of said first door.

34. The system of claim 33, wherein:

- (a) said electrode arrangement includes a third electrode and a fourth electrode; and
- (b) said electrode arrangement and said electrical supply system are configured, such that when said electrical supply system is

actuated there is at least one central region of zero field gradient within said chamber.

35. The system of claim 20, further comprising a secondary pumping system associated with said chamber, said secondary pumping system being configured to recycle at least part of said ozone which was added to the chamber.

36. The system of claim 20, further comprising a plasma gun configured for injecting radicals into said chamber.

37. The system of claim 36, wherein said radicals include OH radicals.

38. The system of claim 36, further comprising a connector arrangement configured, such that said plasma gun injects at least part of said radicals into an internal volume of the at least one item.

39. A plasma gun system, comprising:

- (a) a housing;
- (b) a supply system associated with said housing, said supply system being configured to produce first ions and second ions in said housing, said first ions having a first polarity, said second ions having a second polarity;
- (c) a vacuum pump associated with said housing; and

- (d) a first arrangement configured for being charged with said first polarity in order to:
 - (i) repel said first ions, such that at least 50% of said first ions are removed from said housing via said vacuum pump;
and
 - (ii) neutralize at least 50% of said second ions, thereby producing radicals.

40. The system of claim 39 further comprising a second arrangement configured for being charged with said second polarity in order to repel remaining said second ions, such that at least 50% of said remaining second ions are removed from said housing via said vacuum pump.

41. The system of claim 39, further comprising a dispersing arrangement configured to disperse said first ions and said second ions in order to reduce recombination of said first ions and said second ions.

42. The system of claim 41, wherein said dispersing arrangement includes:

- (a) a conducting arrangement;
- (b) an insulation layer configured to insulate said conducting arrangement from said first ions and said second ions; and
- (c) an alternating power supply electrically connected to said conducting arrangement.

43. The system of claim 42, wherein said conducting arrangement includes two cross-aligned grills.

44. The system of claim 39, wherein said first arrangement includes a mesh.

45. The system of claim 39, wherein said supply system includes:

- (a) a water vapor supply configured to produce water vapor in said supply system;
- (b) an electrode arrangement disposed in said supply system; and
- (c) a power supply electrically connected to said electrode arrangement, said power supply and said electrode arrangement being configured for generating electrical discharge in said supply system, such that said electrical discharge produces OH ions from said water vapor, wherein said radicals include OH radicals.

46. The system of claim 39 further comprising a dry vacuum pump configured for pumping said radicals from said housing.